

Running head: INFORMAL LEARNING WITH MOBILE DEVICES

Informal Learning Evidence in Online Communities of Mobile Device Enthusiasts

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### Abstract

This paper describes a study that investigated the informal learning practices of enthusiastic mobile device owners. Informal learning is far more widespread than is often realised. Livingston (2000) pointed out that Canadian adults spend an average of 15 hours per week on informal learning activities, more than they spend on formal learning activities. The motivation for these learning efforts generally comes from the individual, not from some outside force such as a school, university or workplace. Therefore, in the absence of an externally imposed learning framework, informal learners will use whatever techniques, resources and tools best suit their learning needs and personal preferences. As ownership of mobile technologies becomes increasingly widespread in the western world, it is likely that learners who have access to this technology will use it to support their informal learning efforts. This paper presents the findings of a study into the various and innovative ways in which PDA and Smartphone users exploit mobile device functionality in their informal learning activities.

Vavoula (2004) highlighted some of the difficulties inherent in researching informal learning; it can be intentional or unintentional and people may even be unaware that any learning has taken place. There is also the practical problem of locating a pool of mobile device users who not only engage in mobile informal learning, but who are also willing to provide information about their activities.

PDA and Smartphone enthusiasts were targetted as the community most likely to be using their devices in informal learning and participants were recruited from the active community of web forum users. Web forums are internet-based, asynchronous discussion groups that are aimed at people who share a specific interest; in this case, mobile devices. Messages were posted in the forums inviting members to participate in a web survey on informal learning

with mobile devices. This approach was successful, generating over 200 responses of which over 100 described informal learning with mobile devices.

The findings suggested that mobile device users deploy the mobile, connective and collaborative capabilities of their devices in a variety of informal learning contexts, in quite innovative ways. Trends emerged, such as the increasing importance of podcasting and audio, which may have implications for future studies. Informal learners identified learning activities that could be enhanced by the involvement of mobile technology, and developed methods and techniques that helped them achieve their learning goals.

This paper describes the methods used in the study and discusses the results, locating them in the context of the wider literature on informal learning. It explores key issues, such as participation in collaborative informal learning, that emerged from the findings and outlines research directions arising from the study.

## Informal Learning Evidence in online Communities of Mobile Device Enthusiasts

### Introduction

According to Tough (1979) an informal learning project is a deliberate effort to gain new knowledge or skills or obtain improved insights or understandings. Livingston (2000) defined informal learning as any activity that involved learning which occurred outside the formal curricula of an educational institution. Livingston went on to make a clear distinction between explicit informal learning, and tacit informal learning which is incorporated into other social or ad-hoc activities. Both forms of learning result in the acquisition of new knowledge or skills, however only the explicit informal learning project is motivated by some immediate problem or need as defined in Tough's (1979) definition of informal learning.

Vavoul, Scanlon, Lonsdale, Sharples, and Jones (2005) developed the classification of informal learning by separating out the goals of learning from the processes of learning as illustrated in Figure 1.

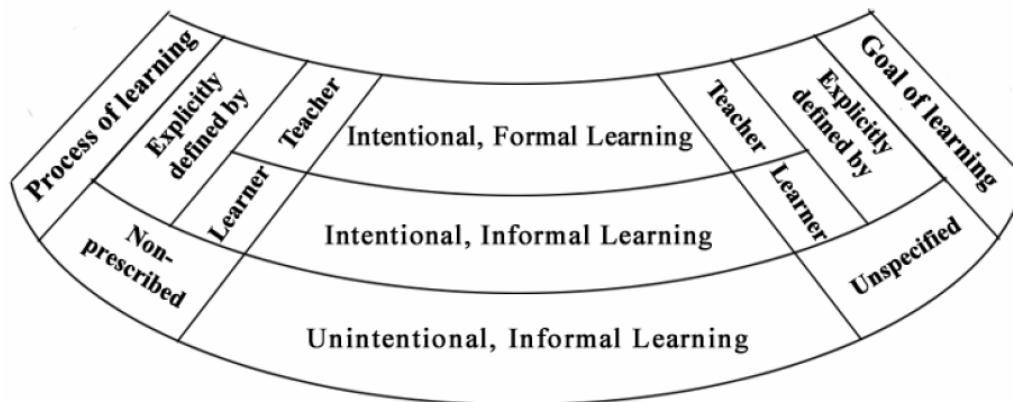


Figure 1. Typology of Informal Learning reproduced from Vavoula et al., (2005)

If both the goals and processes of learning are either explicitly defined by the learner in advance (intentional informal learning) or selected at the point at which the learning opportunity

presents itself (unintentional informal learning), then the tools used to support the learning will also be self-directed. As technology advances, so does the range of potential learning tools.

This paper reports on the results of a study to investigate the informal learning practices of people who owned mobile devices (PDAs or smartphones). Specifically, we asked the question “Do mobile device owners use their devices to support their informal learning projects and if so, how?”

Smartphones are primarily communication devices, and many PDAs now offer several communication protocols such as GPRS and/or wifi. This connectivity supports synchronous communication using voice or instant messaging as well as asynchronous communication via email, weblogs, web forums, wikis and virtual learning environments. In recent years researchers have investigated the potential of mobile handheld devices to support collaborative learning, devising educational scenarios that make use of their collaborative, interactive and mobile capabilities. PDAs have been introduced into schools, both inside the classroom (DiGiano et al., 2003) and outside the classroom in support of fieldwork (Chen, Kao, & Sheu, 2003). Research has also been conducted in the wider learning sphere, with the use of handhelds as interactive museum guidebooks (Hsi, 2003) and as tools to support medical students on hospital placements (Smørdal & Gregory, 2003). Rochelle (2003) identified two forms of collaborative participation; “the normal social participation in classroom discussion (for example) and the new informatic participation among connected devices” (p.262). He discovered that in the classroom setting, where the learners were in the same physical space, the normal face-to-face social interaction was supplemented by the wireless interaction between the connected devices. In this context, mobile devices added a new social dimension of participation that was not otherwise available. Given the growing evidence of support for mobile collaboration in more formal learning

contexts, this study also asked “Do informal learners make use of the connectivity afforded by their mobile devices to engage in collaborative learning?”

### Method

In order to obtain insights into ways in which experienced users use mobile devices to support informal learning, this research needed to plug into existing networks and communities of mobile device users. A method was required that would capture information about participants’ informal learning practices and experiences. PDAs and Smartphones are mobile devices and their users may be located anywhere in the world, so a web-based survey method was chosen. This gave access to a wide pool of participants without requiring them to be in any specific geographic location.

Surveys use structured questions to obtain self-reported data from participants. Although surveys are best suited to multiple-choice, quantitative measurements, some of the questions could be adapted to request open-ended, diary-type responses to unearth details of informal learning experiences. By circulating the questionnaire via the Web, additional advantages would accrue. It could be accessed from anywhere in the world, at any time of day, regardless of time-zones and it could be publicised via email and the internet.

In order to identify the preferences and informal learning episodes of experienced mobile device users, we needed a group of users with some level of experience in using their mobile device. Internet-based web forums were selected as the best place in which to find them. There is an active internet-based community of PDA and Smartphone users who participate in a variety of user forums. Membership is free and asynchronous discussion threads allow participants to seek help and discuss a wide variety of device-related issues. Three businesses were also contacted

and agreed to circulate an email to employees with a business PDA or Smartphone, inviting them to participate in the research.

The web survey was published over a period of four weeks in summer. During this time, over 200 responses were returned. When asked whether they used their mobile device to support their informal learning, 53% said that they did and provided details. The questionnaire distinguished between informal learning in general and informal learning for which a mobile device was used in some way. There was no great difference in the occurrence of informal learning between PDA users and Smartphone users. However, PDA users were significantly more likely to use their mobile device in support of their informal learning with 61% of PDA users using their mobile device compared to 31% of Smartphone users ( $\chi^2_{(3)} = 19.26, p < 0.001$ ).

The responses were classified using a functional framework devised by Patten, Arnedillo Sanchez, and Tangney (2006). This functional framework was designed as a tool with which to analyse handheld learning applications and evaluate their pedagogical underpinning, however the informal learning activities reported by the survey participants fitted reasonably well.

According to this framework mobile learning applications can be sub-divided into seven categories:

1. **Collaborative applications** that encourage knowledge sharing, making use of the learner's physical location and mobility.
2. **Location aware applications** that contextualise information, allowing learners to interact directly with their environment, for example, collecting environmental data linked to geographical context or accessing contextually relevant reference material

3. **Data collection applications** that use the handheld device's ability to record data in the form of text, image, video and audio
4. **Administrative applications** that employ the typical scheduling, information storage and other calendar functions available on mobile devices
5. **Referential applications** that use dictionaries, translators and e-books to deliver content when and where it is needed
6. **Interactive applications** that use both the input and output capabilities of mobile devices, allowing the learner to input information and obtain some form of feedback which aids the learning process
7. **Microworld applications** model real world domains to enable learners to use practice in a constrained version of the learning scenario. This category was not found in the informal learning results.

Figure 2 groups the informal learning activities described by the survey participants into categories based on the Patten et al., (2006) functional framework.

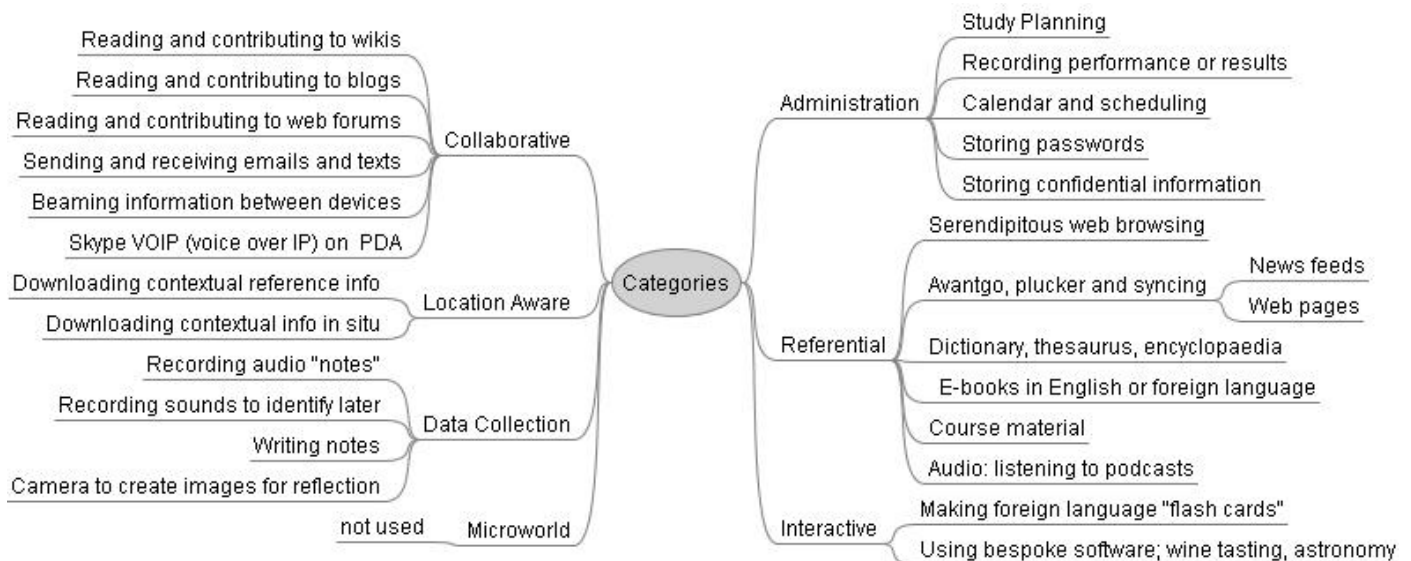


Figure 2. Informal Learning Activities



### Collaborative activities

There was a significant difference between PDA and Smartphone users in the level of communication they engaged in using their mobile device, with 100% of Smartphone users using their device to communicate with other compared to 80% of PDA users. Since Smartphones are first and foremost mobile phones, with their high level of connectivity, this result is predictable. Given these fairly high rates of communication using mobile devices, we might expect high levels of collaborative learning.

When asked to provide details of collaborative learning, only 21% of PDA users and 19% of Smartphone users who used their devices to communicate with others felt that they collaborated. However, in their full-text descriptions, some device users demonstrated that they did collaborate; they just did not always recognise it as such. Table 1 lists the main forms that collaborative learning took:

Collaborative resource	How it is used
Blog or Weblog	A form of online diary that is easy to create and maintain, and which can be set to allow updates from more than one person. Some participants cited “downloading blogs” as a collaborative activity
Wiki	A group website, similar to a collective blog, where members can create collaborative web pages, updatable by more than one individual and contribute to discussion threads.
Web forum	Websites relating to a particular theme that are maintained by a group of administrators, but which have information threads that can be created and added to by members.

Beaming and sharing information	Sharing data between mobile devices using infra red “beam”. Contributing information to a shared database, or one-to-to-one information sharing.
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Table 1. Forms of Collaborative Activities

The collaborative activities described generally occurred through the sharing of data in some way, usually by uploading it onto a central server hosting a web forum, wiki or blog. For example, “Collaborating photos and notes to a central server i.e a wiki of sorts”

Web forum users collaborated in many areas, helping each other solve technical problems by posting and answering questions in the forums, building collaborative data bases of information through wiki entries, however in many cases this collaboration took place via the desktop interface rather than that of the mobile device. At the time of the study (summer 2005) internet connectivity using mobile devices was still expensive and the interface clumsy.

#### Location Aware Activities

Patten et al., (2006) looked at location aware learning applications which use Global Positioning Systems (GPS) and sensors to identify geographical context and promote learner engagement. In 2005 when the survey was conducted, GPS-enabled PDAs were just arriving on the market and the survey participants were beginning to use GPS in their learning. However, the informal learning reported seemed to involve learning how to use GPS applications rather than using the locational awareness to create some form of mobile learning context within the activity.

### Data Collection Activities

In the context of this functional framework, data collection refers to the use of mobile devices for recording data and information about the environment. This data may be recorded for reflective purposes, such as taking notes or pictures, or it may consist of observational data that is combined with the observations of others to produce an information database which may provide further learning opportunities. The survey participants did not report collecting observational data, however they did describe recording audio, notes and images.

#### Audio Data Collection

The audio recording facilities of mobile devices were used by some participants either as an alternative to writing notes on the device, or as a way of recording ambient sounds. For example. One participant reported: “I use my voice recorder to record magic lectures. I also use the memo application for taking notes at magic lectures, taking down important information such as Originators of magical effects, funny lines to remember, names of books, and various sleights to learn”.

#### Taking Notes

Note taking was cited frequently in the context of informal learning. The reasons for taking notes were varied and included:

- Noting down thoughts and ideas to follow up later
- Making notes whilst learning (languages, hobbies)
- Annotating downloaded material
- Writing lists (topics to research, books to read, events to attend)
- Scanning in handwritten notes to have mobile access to them

The voice recording facility was sometimes used to take notes, and mobility was frequently cited as an advantage of taking notes using the mobile device, for example, “Making notes, keeping information with me so I can revise it often”. This activity mirrors the typical handwritten note-taking that most learners engage in. The advantages of using a mobile device (small size, portability, digital notes format that is easily shared with other devices) appear to outweigh any disadvantages of small screen size, slower data entry and reliance on battery.

### Recording Images

The cameras on mobile devices were not used to a great extent. At the time of the research, many mobile devices did not contain an in-built camera. Two participants mentioned taking pictures to use for reference later, others mentioned sharing pictures with other people, but images did not appear to be used extensively in informal learning with mobile devices. This may be due to the lower quality of mobile device pictures compared to those from even quite inexpensive digital cameras. It is also possible that images would be used more often if better software were available to integrate them with the learning project.

### Looking up Information for Referential Learning Activities

Many participants accessed the web to support their informal learning projects. Some used the PC and transferred the content to the PDA or Smartphone for use when away from the PC. Others accessed the web content directly from their devices using GPRS or wi-fi whenever something sparked their interest, for example one participant wrote “I do a lot of informal learning through wikipedia.org (and that includes using it on my smartphone). I may be thinking about a subject and then I can quickly get out my phone and look the subject matter up on the internet”

Podcasting is a method of audio delivery with implications for teaching and learning. Audio broadcasts are published via the Internet, and users subscribe to a “feed” which allows them to download broadcasts in a format that will run on most handheld devices. Two respondents cited listening to podcasts as a form of informal learning that they did with their device. Audio books were also mentioned as a support for mobile informal learning.

Many participants used specific applications to locate and download text-based information; tools such as Avantgo, Plucker and News feeds were frequently mentioned. AvantGo allows users to register and select from a variety of information services. Information services include newspapers, weather reports, maps, traffic reports, medical details, foreign language and English dictionaries. Having subscribed to the services, the latest news, weather etc gets downloaded to the mobile device automatically when it is synchronised with a PC or laptop. Information obtained in this way varied from reference material such as topic specific web sites and wikipedia (a collaborative web-based encyclopedia that is freely available) to up-to-date news.

Many of the learning activities were built around the ability to read the information using the handheld device whilst in some transitory location, i.e. not home, school or office where other information resources are readily available. Learners tended to identify a period of time when their usual information sources were unavailable, often when in transit, and load information onto their mobile device in advance. Learners would download Ebooks, course material, web pages or papers.

These examples illustrate one of the key advantages of mobile devices; their portability and ability to store large amounts of information in a relatively small package.

Some participants described another approach to using the Web. Rather than downloading information that they could read anywhere, anytime, they downloaded information related to a particular place and event. Information could be researched in advance, for example, downloading maps and tourist information before a planned visit. This usage of a mobile device to store reference material for use when visiting places of interest parallels formal research scenarios such as the electronically guided museum visits described by Hsi (2003).

#### Administrative Activities

PDA's have their origins as organisational devices and Smartphones have inherited this functionality with 84% of survey participants using the Calendar/Contacts functionality on a daily basis.

#### Interactive Activities

Where software that would support their learning was available, informal learners made use of it. Applications included wine tasting and charting software, applications for tracking diet and fitness and astronomical charting software. Where the software was not available, some learners were prepared to adapt existing applications, or produce new applications themselves. One participant devised an ingenious way to combine the notes application and the voice-recording in order to support his language learning. He first wrote the question on the note or “front side of the flashcard”. Then he made an audio recording which he associated with the note as the “back side of the flashcard”. The link to the recording was right next to the text so that he could read the text, say his answer and then check it against the voice-recorded correct answer. Another participant wrote an onboard compiler as well as most of his applications directly on his device, as a hobby which he described as “a never ending learning process in programming knowledge”. His ultimate informal learning goal was to write a compiler.

Many mobile device users do not have this level of expertise, but it seems that acquiring a mobile device can trigger device-related learning.

### Microworld Applications

Microworlds did not seem to be a category well suited to informal learning since it required the creation of an application that models a real-world domain. No informal learning that would fit into this category was described.

### Conclusion

The results of this study suggest that this population of mobile device users use their devices to support a wide range of informal learning activities, both intentional and unintentional. The portability, storage capacity, computing power and convenience of mobile devices emerged as determining factors in learners' decisions to use them to support informal learning activities. The fact that people generally carried their devices around with them meant that they were "on hand" to support serendipitous learning opportunities as well as planned mobile learning activities.

The Patten et al., (2006) functional framework was helpful in classifying the responses, however some branches of the framework were difficult to map onto the reported informal learning activities, and some of the activities seemed to fit in more than one branch of the framework. Collaboration emerged as a key theme, although one that was relatively unrecognised as such by the participants. The functional framework describes collaborative applications as those that encourage knowledge sharing. However, some of the data collection, referential and location aware activities described by the informal learners also involved knowledge sharing. This meant that there was some overlap between the categories, with certain learning activities having both an "individual" and a "collaborative" element.

The decision to survey expert mobile device users bypassed many of the device usability issues that characterised previous studies (Waycott, 2004), (Smørdal & Gregory, 2003), (Commarford, 2004). For example, the survey participants did not use any one method of data entry (thumbpad, soft keypad, letter recognition, external keyboard) in preference to the others. Instead, participants adapted to the data entry method that worked best for them, with 64% of respondents reporting that they found it “quite easy” or “very easy” on a five-point Likert scale to enter data into their device. When asked how easy they found it to read from the screen, 95% responded “quite easy” or “very easy”. Participants adapted to the mobile interface, and evolved ways to integrate the power, storage and connectivity offered by their PDAs and smartphones with their informal learning processes.

A more surprising finding was the extent to which some participants adapted their devices to suit their learning needs, writing new applications or tailoring existing ones, and adapted how they learned to suit the functionality available with their devices. These adaptations seem to be a step beyond the simple process of appropriation of PDAs as workplace and learning tools as described by Waycott, (2004). Waycott defined appropriation as the integration of a new technology into the user’s activities. Her analysis showed that there is a two way process in which users adapt the tools they use according to their every day practice, prior expectations and personal preferences in order to carry out their activities and, in turn the tools also change the user’s activities. For example, in Waycott’s studies participants who were touch-typists coped with the usability constraints of the PDA by using it with a foldout keyboard or as an adjunct to their desktop computer. This adaptation made it easier for them to enter text into the PDA and enabled them to ‘fit’ the use of the PDA into their every-day preferred practice. In this study some participants went to great lengths to tailor their use of their mobile device to fulfil their



learning goals. The participant who combined text and audio to support his language learning invested a considerable amount of time and effort in adapting the notes application to support his language learning needs. The participants who downloaded material in advance of planned visits had taken the explicit decision to use their mobile device as a learning resource in a mobile context.

This enthusiasm for using mobile devices came across in many of the text responses. The following example is typical of both the content and the length of many of the descriptions of informal learning with mobile devices: “Researching further about geography or science topics I’ve read about at online sites (Amazon Bore surfing; parasitic creatures). Learning about obscure and/or specific details and terms such as the exact term for a castrated male ‘cow’ (bullock)... could be classified as ‘research related to settling a bet’! Learning new language uses such as urban slang, web chat acronyms, etc. Learning about technology (pdastreet.com forums, MS Windows program shortcuts and how-tos, etc.).” However it is important to remember that the participants in this survey were selected because they were keen mobile device users. This finding may not be reflected in the mobile device using population in general, although as mobile connected technology becomes ubiquitous, it is likely that increasing numbers of mobile device owners will employ their devices as learning tools.

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Table 1

Forms of Collaborative Activities

Figure Captions

Figure 1. Typology of Informal Learning (reproduced from Vavoula et al., 2005)

Figure 2. Informal Learning Activities

